Bionomics and immature stages of the Barleria Lacebug *Habrochila laeta* Drake Heteroptera: Tingidae[1]

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(With two text-figures and three graphs)

The life history and population fluctuation for the three principal seasons of *Habrochila laeta* Drake has been studied. The nymphal stages have been described in detail. Graphs relating to growth rates of various parts of the body to the body length have been provided.

Introduction

Tingid bugs, also known as lace wing bugs are phytophagous insects which often inflict appreciable damage to plants due to their habit of feeding on plant sap and many species are known to be pests of crop plants. Studies on the nature of damage caused and biology are available of a few species namely *Telonemia surupulosa* Stal. (Khan 1945, Roonwal 1952), *Tingis beesoni* Drake (Mathur 1955), *Urentius echinus* Dist. (Patel & Kulkarny 1955), *Monanthia globulifera* Walker (Sharga 1953), *Stephanitis typicus* Dist. (Ayyar 1963, Mathen 1960, and Mathen *et al.* 1969), *Monastria minutula* Montandon, *Tingis buddleiae* Drake, *Cadmilos retiarius* Dist., *Urentius euonymus* Dist. (Livingston 1959, 1962 and 1968) and *Corythauma ayyari* Drake (David 1958, Dorge 1971). Mohanasundaram & Basheer (1963) have reported on the effect of weather factors on the population fluctuation of the Tingid, *Habrochila laeta* Drake, on *Barleria cristata* while David & Rangarajan (1966) noted it as one of the important pests of the flowering shrub *Barleria* spp. However, information on the habits, biology and immature stages of *H. laeta* appear meagre and the results presented here provide the necessary data.

[1] Accepted June 27, 1972.

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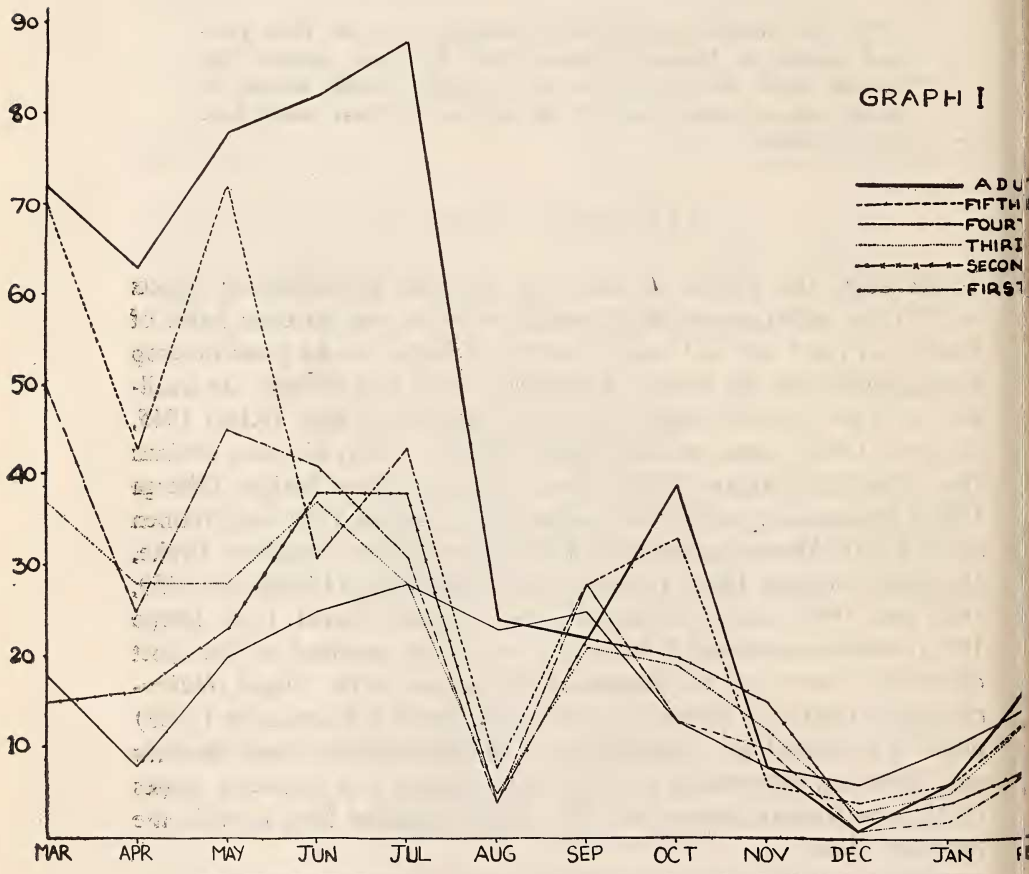
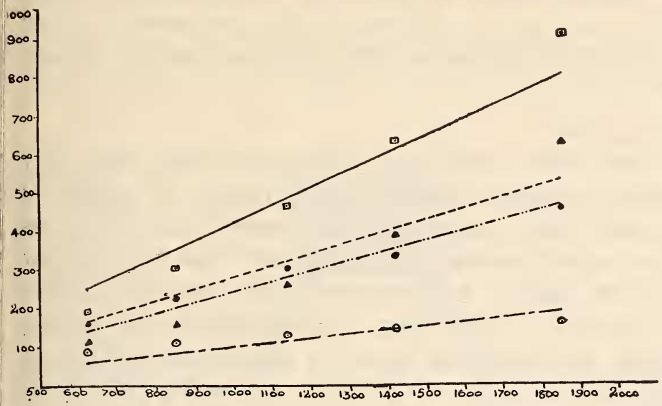
Material and Methods

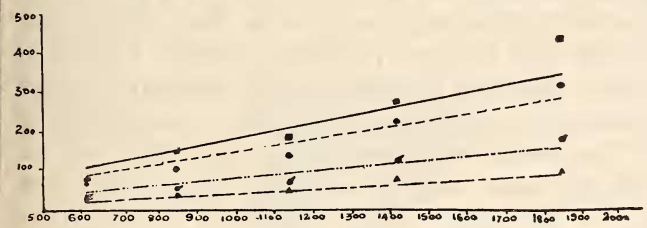
The observations on the seasonal abundance and behaviour of the insect were made in a field at Poonamallee, near Madras. The population of the adult and different instar nymphs on ten leaves, collected at random was recorded at intervals of about a fortnight, during the period March 1971 to February 1972. The studies on the life history of the insect were carried out in laboratory. Temp. 29 ± 2°C, R. H. 75 ± 5%). The figures were drawn using a graticule and measurements were taken with a micrometer. Measurements of body parts of immature stages when plotted against body length have shown a linear relationship. The regression equations have been calculated using the formula Yc = a + bx, where 'Yc' is the calculated value of each observed value, 'a' and 'b' constants and 'x' body length. (Graphs II & III).



Graph I. Seasonal fluctuation of *Habrochila laeta* Drake during the period from 1971 March to 1972 February.



GRAPH II



GRAPH III

Graph II. Body width, width of Head, length of tibia and Tarsus in relation to body length.

Width of Body; Width of Head;
Length of Tibia; Length of Tarsus.

Graph III. Antennal segments in relation to body length.

First segment; Second segment;
Third segment; Fourth segment.

Seasonal occurrence and habits of the insect

The insect is found practically throughout the year on *Barleria cristata*. The population fluctuations of the adults and different nymphal instars for the three principal seasons are presented in Graph I. Infestation on the plant is more severe during summer months. The population is much reduced during monsoon and winter, perhaps due to adverse weather conditions. All the developmental stages occur on a single leaf and during peak infestations a single leaf may carry as many as 52 individuals of different stages. Adults and immature stages feed on the leaf content mainly from the ventral side causing the development of pale-yellow patches and ultimately shedding of the leaf. The younger ones, particularly the first and second instars show a gregarious tendency during feeding. The attack on the plant is gradual but severe. When the leaf is completely covered with excreta, the individuals migrate to fresh leaves. The adults have very weak wings and flying ability is very low. Dispersal takes place by contact and also

by wind. It was noticed that if the plants are cultivated in separate batches all of them may not be affected at the same time; whereas if they are planted in a row, infestation starts from one end and spreads to the other end.

Copulation and Egg laying

Females mate soon after emergence with males which mate only after 40 to 50 hours of their emergence. The process of mating is initiated by the male which approaches the female and flutters its wings for some time, before climbing over the female. Then the posterior end of the body of the male is bent posterolaterally and after two to three attempts it succeeds in copulating. Still attached to the female, the male slides down the female and takes it's position on one side of the female so as to make an angle of about 50°. The mating individuals do not feed but sometimes exhibit slight movements. They remain with heads turned downwards and antennae produced upwards. The whole process lasts for more than one hour (60 to 70 minutes). Similar type of mating behaviour has been reported for *Tingis buddleiae* Drake (Livingston 1968). The females were observed to mate only once in their life time, while the males mate three to four times with virgin females.

Pre-oviposition period lasts from 30 to 36 hours and oviposition period from 7 to 8 days. A female lays an average of 40 eggs in its life time.

The site on the leaf where eggs are laid varies in different species of Tingidae. *H. laeta* lays the eggs mostly on the dorsal surface on either side of the midrib of the leaves after making a small puncture with its gonopophysis. The process of egg laying lasts for 7 to 8 minutes. The eggs are always placed singly and in a slanting position. The opercular region projects out of leaf surface while the posterior part of the egg reaches the mesophyll (Fig. Ib). Two to three days after egg laying, the area of the leaf surrounding the egg becomes translucent. In the case of *Telonemia scrupulosa,* Roonwal (1952) observed gall formation in the leaf, where the egg is laid. No gall formation has been observed in the present study. Johnson (1936) and Livingston (1962) have reported smearing of the faecal fluid over the operculum in the eggs after its deposition in *Leptobrysa rhododendri* and *Dictyla suffata* respectively. No such smearing of the faecal fluid was noted in *H. laeta.*

Egg (Fig Ia)

Elongate, pale yellow, shining, marked with irregular sculptures on outer surface; micropylar part brownish, narrow; inserted end blunt. Outer surface of operculum irregular with brownish hexagonal sculptures. Eight to eleven faint longitudinal canals present in the polarito disci (Fig. Ic); canals lead to a circular canal present below the neck. The polarito disci similar to that of *Tingis*

stachydis (Stusak 1968). Basis operculari thick, continued through the outer part of chorion.

The incubation period during October-November has been found to be between 9 to 11 days. The process of hatching lasts for about

Fig. I

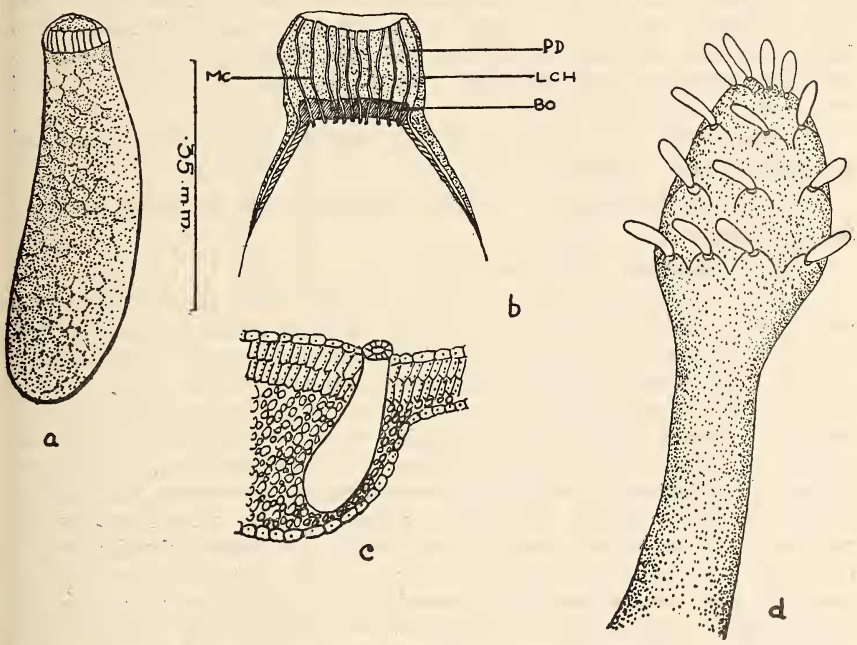


Fig. I. a—Egg; b—Opercular part of egg; c—Section of leaf showing the position of egg; d—Tubercle of the abdominal segment (enlarged).
BO—Basis operculari; LCH—Limbs chorioni; PD—Polarito disci; MC—Microphylar canal.

ten minutes. The opercular region is lifted and pushed to one side along with a part of endochorion. The vertex of head emerges first followed by the first pair of legs which, after establishing a grip on the leaf surface draws out the body. For about 15 minutes the tiny whitish young do not feed, for the rostrum is attached to the ventral body by the ecdysial fluid.

First Instar (Fig. IIa)

Head markedly conical; clypeus prominent; anterior part of frons beset with three small protuberances two lateral and one median, each with a long spine, median spine bifurcated at base; vertex with a single protuberance bearing two spines; all the spines globulated; ecdysial suture prominent, reaching up to the second abdominal segment; antennae long, four segmented, hyaline and setose; terminal segment brown with the setae longer and thicker; rostrum hyaline, four segmented, with blackish fourth segment; stylets extend beyond rostral sheath. Eyes rose red with five ommatidia. Pronotum broad with straight anterior and convex posterior margins; median dorsal side with two protuberances one on either side of ecdysial suture, each with a spine; mesothorax

as broad as prothorax, with median tubercles placed a little away from the ecdysial line; metathorax narrow, without dorsal spines; pro, meso and metathoracic segments with spines laterally, one on each side; hind leg longer, coxa broad; trochanter indistinguishable; femur as long as tibia; tarsus unsegmented, brownish with two claws; setae present in distal segments, those of tarsus longer and thicker. Abdomen as broad as thorax; first segment narrow; second segment prominent with a pair of lateral tubercles and spines, median dorsal side with a tubercle bearing two spines; third and fourth segments similar with lateral tubercles and spines; fifth, sixth and eighth similar to second in tubercular arrangement; seventh and ninth to third and fourth; tenth narrow, conical with three or four sharp spines at tip.

Dorsal scent glands hardly visible between third and fourth and fourth and fifth segments.

The first instar moults to second instar between 48 to 60 hours.

Second Instar (Fig. IIb)

Slightly elongate, yellowish brown.

Clypeus elongate, anterolateral sides of the frons with protuberances each with a pair of spines; median dorsal side of the frons with a club shaped short tubercle bearing small scoli at its tip; similar tubercles present on vertices too; ecdysial suture similar to that of first instar; first two antennal segments equal in length; third longest; fourth longer than the first and second; first three segments of rostrum hyaline, fourth blackish brown, reaching only up to the second abdominal segment. Pronotum three times wider than long, with anterior concave, posterior straight and lateral convex margins; mesonotum with anterior straight, posterior concave and lateral convex margins; metanotum narrow; pro, meso and metathoracic segments bear lateral club shaped tubercles, one on each side. Legs similar and spinous. First segment of abdomen narrow, convex anteriorly and concave posteriorly; second similar to first but with a median dorsal tubercle; third similar to first but wider; fourth broader than third and bears a pair of lateral tubercles; fifth with dorsal and lateral tubercles; sixth similar to fifth in tubercular arrangement but narrow; seventh similar to fifth in the tubercular arrangement; eighth with a small stumpy dorsal tubercle and a pair of lateral processes bearing spines; ninth narrower than eighth and bears lateral processes and spines as on eighth; tenth tubular with four to six spines.

The second instar transforms to third after 30 to 38 hours.

Third Instar (Fig. IIc)

Elongate. Deep brown with a blackish tinge.

Anterior part of head oval; frons bears three club shaped stalked tubercles two fronto-lateral and one dorso-median. Of the four antennal segments, second smallest, third longest fourth longer than the first; eyes rose-red with 12 to 16 ommatidia. Prothorax large, almost half the size of entire thorax; with lateral tergal expansions extending little beyond the level of eyes; mesothorax smaller than prothorax but longer than metathorax; metathorax very small, median dorsal side alone is visible; tubercular arrangement as that of second instar. Abdomen oval. Second segment longer than the first with a median dorsal tubercle; fourth and fifth constitute the widest part of body; ninth segment with lateral club shaped tubercles; tenth with five to seven spines.

The third instar moults after 35 to 42 hours.

Fourth Instar (Fig. IId)

Broadly oval and blackish brown.

TABLE 1

MEASUREMENTS OF NYMPHAL INSTARS IN MM. EACH FIGURE IS AN ARITHMETIC MEAN BASED ON 10 INDIVIDUALS

Instar	Body		Width of	Length of antennal joints				Length of Rostrum				Length of hind leg	
	Length	Width	Head	I	II	III	IV	I	II	III	IV	Tibia	Tarsus
I	0.614	0.195	0.161	0.034	0.034	0.076	0.080	0.076	0.106	0.038	0.102	0.110	0.089
II	0.839	0.300	0.225	0.051	0.041	0.119	0.110	0.088	0.121	0.051	0.102	0.161	0.110
III	1.128	0.471	0.306	0.063	0.051	0.164	0.148	0.096	0.157	0.068	0.127	0.260	0.123
IV	1.414	0.632	0.335	0.102	0.076	0.263	0.215	0.140	0.187	0.079	0.143	0.396	0.147
V	1.844	0.926	0.459	0.178	0.085	0.442	0.319	0.178	0.246	0.085	0.178	0.629	0.166
Adult													
Male	2.046	0.892	0.467	0.348	0.110	0.952	0.378	0.204	0.263	0.110	0.178	0.969	0.170
Female	2.244	0.990	0.467	0.357	0.119	0.943	0.365	0.212	0.263	0.110	0.187	0.986	0.178

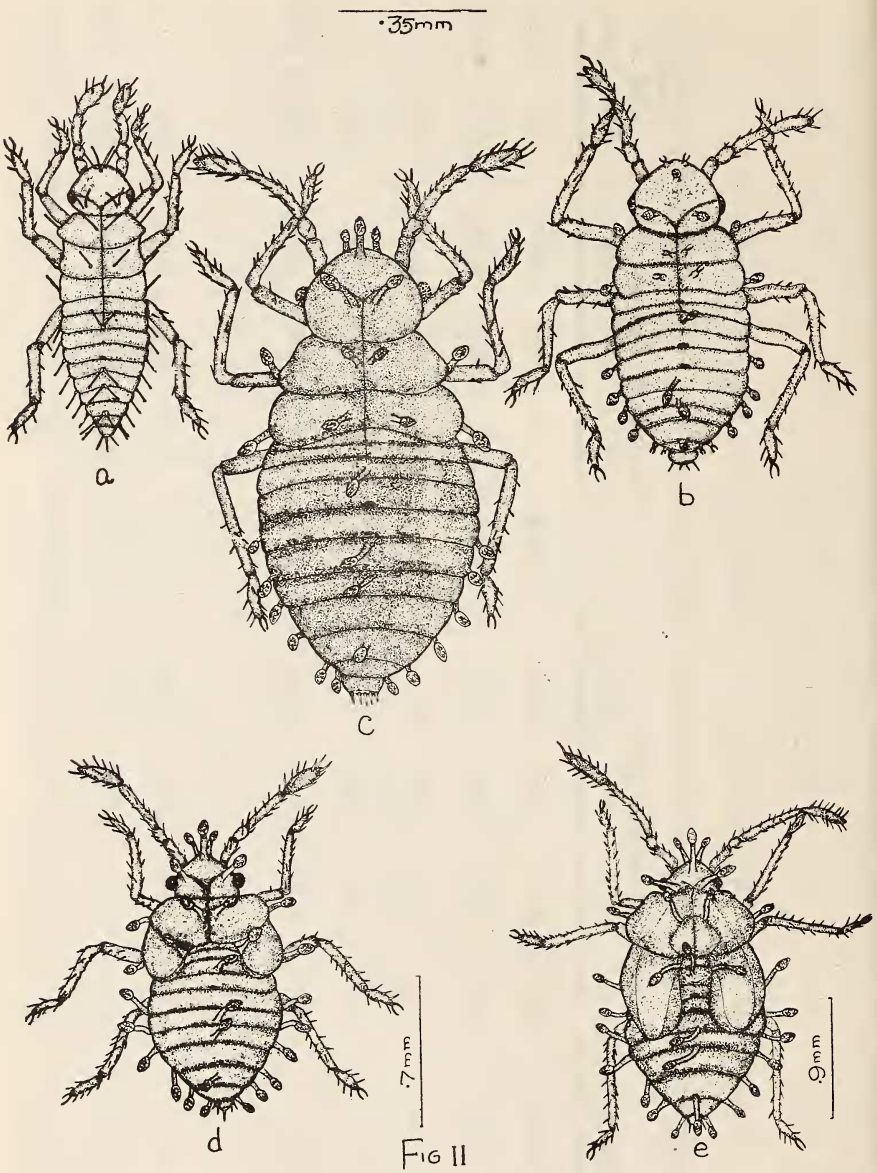


Fig. II. a—First Instar nymph; b—Second Instar nymph; c—Third Instar nymph; d—Fourth Instar nymph; e—Fifth Instar nymph.

Head oval with conical clypeus; head tubercles similar to those of third instar except for being longer; fourth segment of antenna deep brown with almost blackish bristles; rostrum reaches only up to the metathoracic segment; eyes deep brown with imbricately arranged ommatidia. Prothorax with straight anterior and convex lateral margins; posterior margin convex with a longitudinal cleft through centre, the ecdysial suture passing through it; metathorax with wing pads reaching upto third abdominal segment; outer margin of wing pads

convex, inner concave and posteiror blunt. The process of "translocation" (Stusak & Stays 1959) by which the tubercles of the mesothorax become associated with the wing pads occurs at this stage. Abdomen compact with tubercles similar to those of third instar; tenth segment very small with five to eight backwardly directed spines.

After 42 to 50 hours the transformation to fifth instar takes place.

Fifth Instar (Fig. IIe)

Oval. Blackish brown except for femur, tibia, proximal tarsus and first three antennal segments which are pale yellow.

Head roughly triangular; tubercles (Fig. Id) much longer and brown, those of vertices directed side ways; median part of vertex covered over by anterior extension of pronotum; eyes red brown with imbricately arranged ommatidia. Fourth segment of antenna black. Pronotum with large lateral and median anterior expansions; hood developed on its posterior side; dorsal spines of pronotum become associated with anterolateral sides of hood; wing pads long, reaching up to posterior limit of fifth abdominal segment; wing pads of metathorax smaller. Central part of abdomen forms the widest part of body; lateral sides of first five segments almost covered by wing pads; tenth segment very narrow with posteriorly directed spines.

The fifth instar moults to imago within 60 to 70 hours.

The adults were described by Drake (1954). The males are lighter in colour, shorter and narrower in size than the females.

General observations

At the time of moulting all the nymphal instars are whitish in colour which gradually turns to dull yellow in first and second instars, brownish yellow in third and blackish brown in fourth and fifth. The body surface acquires a shining texture after sometime. The fifth instar, white at the time of emergence, acquires a blue tinge a little later and finally turns to shiny black.

In all instars the Y-shaped ecdysial suture is not prominent at the time of moulting. It appears as a transparent streak after two to three hours. Dorsal abdominal glands which are hardly visible in the first instar become clearly visible in the second, third, fourth and fifth instars.

At the time of emergence of the imago, the hexagonal and pentagonal ridges of the hood are connected by a whitish membrane. This membrane later becomes transparent and the ridges blackish.

The adult males live from seven to eleven days and females from eight to fourteen days.

ACKNOWLEDGEMENTS

I am grateful to Dr. A. P. Kapur, Director, Zoological Survey of India and Dr. K. Reddiah, Superintending Zoologist, Zoological Survey of India for giving facilities. Grateful thanks are also due to Dr. T. N. Ananthakrishnan, Director, Entomology Research Unit, Loyola College, Madras for suggesting the problem and his constant encouragement in this investigation.

References

Ayyar, T. V. Ramakrishna (1963): Hand book of Economic Entomology of South India. Second edn; Govt. press, Madras p. 516.

David, B. V. & Rangarajan, A. V. (1966): Insects affecting *Barleria* spp. in Coimbatore. *Indian J. Hort. 23* (3 & 4): 191-195.

David, S. Kanakaraj (1958): Insects affecting Jasmine in the Madras State. *Madras agri. J. 45*(4):146-150.

Dorge, S. K. (1971): A note on *Corythauma ayyari* Drake (Tingidae) as a pest of *Jasminum* spp. in Maharashtra State. *Sci. & Cult. 37*:156-157.

Drake, C. J. (1954): A miscellany of New Tingidae (Hemiptera). *Proc. Biol. Soc. Wash. 67*, p. 12.

Johnson, C. G. (1936): The biology of *Leptobrysa rhododendri* Horwath. *Ann. Appl. Biol. Cambridge 23*:342-368.

Khan, A. H. (1945): On the Lantana bug. (*Telonemia scrupulosa*). *Indian J. ent. 6* (1-2):148-151.

Livingston, D. (1959): On the bionomics and immature stages of *Urentius euonymus* Dist. (Heteroptera, Tingidae) a sap sucker on Hollyhock and other garden plants. *Proc. 1st. All Indian congress Zool. part 2*: 510:519.

——————— (1962): On the biology and immature stages of a sap sucker on *Zizyphus jujuba, Monastria minutula* Montandon, a species new to India. (Heteroptera, Tingidae). *Agra Univ. J. Res. (Sci). 11*(1):117-130.

——————— (1962): On the biology and immature stages of *Cadmilos retiarius* Dist. (Heteroptera, Tingidae) a sap sucker on Compositae. *Agra Univ. J. Res. (Sci). 11*(3):47-62.

——————— (1968): On the morphology and bionomics of *Tingis buddleiae* Drake (Heteroptera, Tingidae) Part I. Bionomics. *Agra Univ. J. Res. (Sci). 17*(3):1-16.

Mathur, R. N. (1955): Immature stages of *Tingis beesoni* Drake. *Entomologist, London 88* (1110):248-251.

Mohanasundaram, M. & Basheer, M. (1963): Population studies of *Habrochila laeta* Drake (Tingidae: Hemiptera) (abstract). *Madras agri. J. 50*(2):104.

Patel, R. C. & Kulkarny, H. L. (1955): Bionomics of *Urentius echinus* Dist. (Hemiptera: Heteroptera: Tingidae) as an important pest of Brinjal. (*Solanam melogenea*) in north Gujarat. *J. Bombay nat. Hist. Soc. 53* (1):86-96.

Roonwal, M. L. (1952): The natural establishment and dispersal of an important insect in India, the Lantana bug (*Telonemia scrupulosa* Stal.) (Hemiptera: Tingidae) with a description of the eggs, nymphs and adult. *J. Zool. Soc. India 4*(1):1-16.

Sharga, U. S. (1953): Bionomics of *Monanthia globulifera* Walker (Hemiptera: Tingidae). *J. Bombay nat. Hist. Soc. 51*(4):885-889.

Stusak, J. M. (1968): Notes on the bionomics and immature stages of *Tingis stachydis* Fieber (Heteroptera, Tingidae). *Acta. ent. Bohemoslov 65*:412-421.

——————— & Stays, P. (1959): Investigations on the taxonomy and morphology of imagines and nymphs of some species of the genus, *Monanthia* La Pelatier et Serville 1825 (Hemiptera: Heteroptera: Tingidae). *Acta. Univ. Carolane Biologica. 3*: 177-205.